What is claimed is:

1. A cursor control device comprising:
an outer shell having a sensitive region for interaction with a user;
an inner housing nested in the outer shell; and
a sensor disposed within an interior of the inner housing for generating signals based on the user interaction with the sensitive region of the outer shell.

2. A cursor control device according to claim 1, wherein the outer shell is a convex dome having a diameter in a range from 10 mm to 80 mm.

3. A cursor control device according to claim 2, wherein the outer shell has a diameter in a range from 25 mm to 60 mm.

4. A cursor control device according to claim 1, wherein the outer shell includes a window defining a region of the outer shell that includes said sensitive region.

5. A cursor control device according to claim 4, wherein the window is flat.

6. A cursor control device according to claim 4, wherein a layer of a scratch-resistant coating is provided on the window.

7. A cursor control device according to claim 4, wherein the window is made of a scratch-resistant material.

8. A cursor control device according to claim 7, wherein the window is made of glass.

9. A cursor control device according to claim 7, wherein the window is made of sapphire.

10. A cursor control device according to claim 1, wherein the outer shell includes a material for selective filtering of ambient light.

11. A cursor control device according to claim 10, wherein the material filters visible light and transmits near-infrared light.

12. A cursor control device according to claim 10, wherein the sensitive region of the outer shell is a flat window made of the material for selective filtering.

13. A cursor control device according to claim 12, wherein the material filters visible light and transmits near-infrared light.

14. A cursor control device according to claim 12, wherein the outer shell includes a second material for blocking ambient light.

15. A cursor control device according to claim 10, further comprising a filter element for selectively transmitting light to the sensor.

16. A cursor control device according to claim 15, wherein the filter element is disposed within the inner housing along a light path between the sensitive region of the outer shell and the sensor.

17. A cursor control device according to claim 15, wherein the filter element is disposed between the outer shell and the inner housing along a light path between the sensitive region of the outer shell and the sensor.

18. A cursor control device according to claim 15, wherein the filter element transmits only light having a wavelength within a first range of wavelengths.

19. A cursor control device according to claim 18, wherein the material for selective filtering of ambient light transmits only light having a wavelength within a second range of wavelengths.

20. A cursor control device according to claim 1, wherein the outer shell is interchangeable.

21. A cursor control device according to claim 1, wherein the interior of the inner housing is fluidly sealed from an exterior of the inner housing.

22. A cursor control device according to claim 21, wherein the outer shell is removable from the cursor control device, and wherein the interior of the inner housing remains fluidly sealed when the outer shell is removed.

23. A cursor control device according to claim 1, wherein the inner housing includes an integral lens portion having an optical axis that intersects the sensitive region of the outer shell.

24. A cursor control device according to claim 23, further comprising a light source disposed within the interior of the inner housing for illuminating a region proximate to the sensitive region of the outer shell, and wherein the integral lens portion is an illumination lens disposed along an optical axis of the light source between the light source and the sensitive region of the outer shell.

25. A cursor control device according to claim 23, wherein the integral lens portion is an imaging lens disposed along an optical axis of the sensor between the sensor and the sensitive region of the outer shell.

26. A cursor control device according to claim 25, further comprising a light source disposed within the interior of the inner housing for illuminating a region proximate to the sensitive region of the outer shell, and wherein the inner housing further includes an integral illumination lens disposed along an optical axis of the light source between the light source and the sensitive region of the outer shell.

27. In a cursor control device, an optical engine comprising:

a housing;

an imaging lens element integrally formed into the housing;

a light source disposed within the housing for emitting light along an illumination optical axis; and

a sensor disposed within the housing for sensing light along an imaging optical axis that intersects the imaging lens element.

28. An optical engine according to claim 27, further comprising an illumination lens element integrally formed into the housing, wherein the illumination optical axis intersects the illumination lens element.

29. An optical engine according to claim 27, wherein the light source is a light emitting diode.

30. An optical engine according to claim 29, wherein the light emitting diode emits infrared light.

31. An optical engine according to claim 27, wherein the imaging lens element focuses light from a focal plane onto the sensor, wherein an angle between the illumination optical axis and the focal plane is in a range from 0 degrees to 45 degrees.

32. An optical engine according to claim 31, wherein the angle between the illumination optical axis and the focal plane is in a range from 15 degrees to 35 degrees.

33. An optical engine according to claim 32, wherein the angle between the illumination optical axis and the focal plane is 30 degrees.

34. An optical engine according to claim 27, further comprising a filter element disposed along the imaging optical axis for selectively transmitting light to the sensor.

35. An optical engine according to claim 34, wherein the filter element is disposed between the imaging lens and the sensor.

36. An optical engine according to claim 34, wherein the filter element transmits infrared light and prevents transmission of visible light.

37. An optical engine according to claim 27, wherein the sensor includes an array of photodetectors.

38. An optical engine according to claim 27, further comprising a window disposed external to the housing and positioned such that it is intersected by both the illumination optical axis and the imaging optical axis.

39. An optical engine according to claim 38, further comprising a filter element disposed between the window and the sensor along the imaging optical axis for selectively transmitting light to the sensor.

40. An optical engine according to claim 39, wherein the filter element is disposed external to the housing between the window and the imaging lens.

41. An optical engine according to claim 39, wherein the filter element is disposed within the housing between the imaging lens and the sensor.

42. An optical engine according to claim 38, wherein the window is a filter element for selectively transmitting light to the sensor.

43. An optical engine according to claim 42, wherein the window transmits infrared light and prevents transmission of visible light.

44. An optical engine according to claim 42, further comprising a second filter element disposed between the window and the sensor along the imaging optical axis for selectively transmitting light to the sensor.

45. An optical engine according to claim 44, wherein the second filter element is disposed between the window and the imaging lens.

46. An optical engine according to claim 44, wherein the second filter element is disposed between the imaging lens and the sensor.

47. A cursor control device comprising:

an outer shell having a convex dome that includes a centrally located sensitive region for interaction with a user;

an inner housing having a complementary convex dome nested in the convex dome of the outer shell; and

a sensor disposed within an interior of the inner housing for generating signals related to motion proximate to the sensitive region of the outer shell.

48. A cursor control device according to claim 47, wherein the complementary convex dome of the inner housing has a centrally located depression aligned with the sensitive region.

49. A cursor control device according to claim 48, wherein an upper opening of the depression is at least as big as an expanse of the sensitive region.

50. A cursor control device according to claim 48, wherein the sensitive region has a longitudinal dimension in a range of 0.5 mm to 3 mm.

51. A cursor control device according to claim 50, wherein the longitudinal dimension of the sensitive region is 1 mm.

52. A cursor control device according to claim 47, further comprising a light source for illuminating the sensitive region.

53. A cursor control device according to claim 52, wherein the light source is a light emitting diode.

54. A cursor control device according to claim 52, wherein the light source emits infrared light.

55. A cursor control device according to claim 52, further comprising a controller for controlling the intensity of light emitted by the light source.

56. A cursor control device according to claim 55, wherein the controller controls the intensity of light in order to optimize the dynamic range of the sensor.

57. A cursor control device according to claim 56, wherein the controller controls the intensity of light based on a shutter value signal received from the sensor.

58. A cursor control device according to claim 56, wherein the controller controls the intensity of light based on a contrast signal received from the sensor.

59. A cursor control device according to claim 47, further comprising a filter element for selectively transmitting light to the sensor.

60. A cursor control device according to claim 59, wherein the filter element blocks visible light.

61. A cursor control device according to claim 59, wherein the filter element transmits only infrared light.

62. A cursor control device according to claim 59, wherein the filter element defines a region of the outer shell that includes the sensitive region.

63. A cursor control device according to claim 62, further comprising a second filter element disposed between the window and the sensor for selectively transmitting light to the sensor.

64. A cursor control device according to claim 59, wherein the complementary convex dome of the inner housing has a centrally located depression aligned with the sensitive region, and wherein the filter element is disposed within the depression.

65. A cursor control device according to claim 59, wherein the filter element is disposed between the inner housing and the sensor.

66. A cursor control device according to claim 47, wherein the outer shell includes a window, wherein the window defines a region of the outer shell that includes the sensitive region.

67. A cursor control device according to claim 66, wherein the window is integrally formed in the outer shell.

68. A cursor control device according to claim 66, wherein the window is fixed into a depression in the outer shell.

69. A cursor control device according to claim 68, wherein an upper surface of the window is flush with an upper surface of the outer shell.

70. A cursor control device according to claim 66, wherein the window is fixed within a through-hole in the outer shell.

71. A cursor control device according to claim 70, wherein an upper surface of the window is flush with an upper surface of the outer shell.

72. A cursor control device according to claim 47, further comprising an imaging lens disposed between the sensor and the sensitive region.

73. A cursor control device according to claim 72, wherein the imaging lens is integrally formed into the inner housing.

74. A cursor control device according to claim 47, further comprising:
a light source having an optical axis that intersects the sensitive region; and
an illumination lens disposed between the light source and the sensitive region.

75. A cursor control device according to claim 74, wherein the illumination lens is integrally formed into the inner housing.

76. A cursor control device according to claim 47, wherein the inner housing is fluidly sealed.

77. A cursor control device according to claim 76, wherein the inner housing includes an upper dome portion, a base, and a seal between the upper dome portion and the base.

78. A cursor control device according to claim 47, wherein the sensor is an optical sensor.

79. A cursor control device according to claim 78, wherein the sensor includes an array of photodetectors.

80. A cursor control device according to claim 47, further comprising a controller for processing the signals generated by the sensor.

81. A cursor control device according to claim 80, wherein the controller includes:

means for determining a tracking confidence value;

means for determining a projected tracking value using a historical tracking value; and

means for determining an enhanced tracking value using the tracking confidence value and at least one of the projected tracking value and a measured tracking value representative of motion sensed by the sensor.

82. A cursor control device according to claim 81, wherein the means for determining a tracking confidence value uses an illumination value representative of an intensity of light sensed by the sensor, wherein the cursor control device further comprises means for determining said illumination value using a shutter value received from the sensor for a subject sensor scan and a brightness value indicative of an amount of light emitted from the light source during the subject sensor scan.

83. A cursor control device according to claim 82, wherein the enhanced tracking value is calculated such that if the tracking confidence value is a first value then the enhanced tracking value is equal to the measured tracking value, and if the tracking confidence value is a second value then the enhanced tracking value is equal to the projected tracking value.

84. A cursor control device according to claim 83, wherein the enhanced tracking value is calculated such that if the tracking confidence value is a third value then the enhanced tracking value equals a weighted combination of each of the measured tracking value and the projected tracking value.

85. A cursor control device according to claim 81, wherein the measured tracking value is representative of motion sensed by the sensor during a subject sensor scan, and the historical tracking value is related to at least one sensor scan prior to the subject sensor scan.

86. A cursor control device according to claim 85, wherein the historical tracking value is calculated based on the enhanced tracking value for said sensor scan prior to the subject sensor scan.

87. A cursor control device according to claim 85, wherein the illumination value is representative of an intensity of light sensed by the sensor during the subject sensor scan.

88. A cursor control device according to claim 81, further comprising means for providing the enhanced tracking value to a client device for control of cursor motion.

89. A cursor control device according to claim 81, further comprising means for storing the enhanced tracking value in memory.

90. A cursor control device according to claim 89, wherein the means for determining the projected tracking value uses a previously stored enhanced tracking value as a basis for determining the historical tracking value.

91. A cursor control device comprising:

a light source for illuminating a sensitive region;

a sensor for sensing motion in the sensitive region;

a confidence calculation section for determining a tracking confidence value using illumination information received from the sensor;

a projection calculation section for determining a projected tracking value using a historical tracking value; and

an enhancement calculation section for determining an enhanced tracking value using the tracking confidence value and at least one of the projected tracking value and a measured tracking value, the measured tracking value being representative of the motion sensed by the sensor.

92. A cursor control device according to claim 91, wherein the sensor provides a pair of measured tracking values representative of the sensed motion,

wherein the projection calculation section determines a pair of projected tracking values using respective historical tracking values, and

wherein the enhancement calculation section determines a pair of enhanced tracking values, each of the pair of enhanced tracking values being calculated using the tracking confidence value, a respective one of the pair of historical tracking values, and a respective one of the pair of measured tracking values.

93. A cursor control device according to claim 92, wherein each of the pair of measured tracking values, projected tracking values, historical tracking values, and enhanced tracking values is representative of motion in a respective one of a pair of orthogonal directions.

94. A cursor control device according to claim 91, wherein the confidence calculation uses illumination information received from the sensor that includes a shutter value and uses a brightness value indicative of an amount of light emitted from the light source.

95. A cursor control device according to claim 91, wherein the measured tracking value is representative of motion sensed by the sensor during a subject sensor scan, and the historical tracking value is related to at least one sensor scan prior to the subject sensor scan.

96. A cursor control device according to claim 95, wherein the historical tracking value is calculated using the enhanced tracking value for said at least one sensor scan prior to the subject sensor scan.

97. A cursor control device according to claim 95, wherein the illumination information is representative of an intensity of light sensed by the sensor during the subject sensor scan.

98. A cursor control device according to claim 91, further comprising a memory for storing the enhanced tracking value.

99. A cursor control device according to claim 98, wherein the projection calculation section uses a previously stored enhanced tracking value as a basis for determining the historical tracking value.

100. A cursor control device according to claim 91, wherein the enhanced tracking value is calculated such that if the tracking confidence value is a first value then the enhanced tracking value is equal to the measured tracking value, and if the tracking confidence value is a second value then the enhanced tracking value is equal to the projected tracking value.

101. A cursor control device according to claim 100, wherein the enhanced tracking value is calculated such that if the tracking confidence value is a third value then the enhanced tracking value equals a weighted combination of each of the measured tracking value and the projected tracking value.

102. A cursor control device according to claim 91, further comprising an adaptive illumination control section for controlling the intensity of light emitted by the light source.

103. A cursor control device according to claim 102, wherein the adaptive illumination control section controls the intensity of light in order to optimize the dynamic range of the sensor.

104. A cursor control device according to claim 102, wherein the adaptive illumination control section controls the intensity of light based on a shutter value signal received from the sensor.

105. A cursor control device according to claim 102, wherein the adaptive illumination control section controls the intensity of light based on a contrast signal received from the sensor.

106. A cursor control device according to claim 102, wherein the illumination information is based on the illumination information received from the sensor and an intensity at which the adaptive illumination control section is controlling the light source.

107. A processor for a cursor control device having a light source and a sensor, the processor comprising:

means for determining a tracking confidence value;

means for determining a projected tracking value using a historical tracking value; and

means for determining an enhanced tracking value using the tracking confidence value and at least one of the projected tracking value and a measured tracking value, the measured tracking value being representative of motion sensed by the sensor.

108. A processor according to claim 107, wherein the sensor provides a pair of measured tracking values representative of the sensed motion,

wherein the means for determining the projected tracking value determines a pair of projected tracking values using respective historical tracking values, and

wherein the means for determining an enhanced tracking value determines a pair of enhanced tracking values, each of the pair of enhanced tracking values being calculated using the tracking confidence value, a respective one of the pair of historical tracking values, and a respective one of the pair of measured tracking values.

109. A processor according to claim 108, wherein each of the pair of measured tracking values, projected tracking values, historical tracking values, and enhancement tracking values is representative of motion in a respective one of a pair of orthogonal directions.

110. A processor according to claim 107, wherein the means for determining a tracking confidence value uses an illumination value representative of an intensity of light, wherein the processor further comprises means for determining said illumination value using a shutter value received from the sensor and a brightness value indicative of an amount of light emitted from the light source.

111. A processor according to claim 107, wherein the enhanced tracking value is calculated such that if the tracking confidence value is a first value then the enhanced tracking value is equal to the measured tracking value, and if the tracking confidence

value is a second value then the enhanced tracking value is equal to the projected tracking value.

112. A processor according to claim 111, wherein the enhanced tracking value is calculated such that if the tracking confidence value is a third value then the enhanced tracking value equals a weighted combination of each of the measured tracking value and the projected tracking value.

113. A processor according to claim 107, wherein the measured tracking value is representative of motion sensed by the sensor during a subject sensor scan, and the historical tracking value is related to at least one sensor scan prior to the subject sensor scan.

114. A processor according to claim 113, wherein the historical tracking value can be calculated based on the enhanced tracking value for said at least one sensor scan prior to the subject sensor scan.

115. A processor according to claim 113, wherein the illumination value is representative of an intensity of light sensed by the sensor during the subject sensor scan.

116. A processor according to claim 107, further comprising means for providing the enhanced tracking value to a client device for control of cursor motion.

117. A processor according to claim 107, further comprising means for storing the enhanced tracking value in memory.

118. A processor according to claim 117, wherein the means for determining the projected tracking value uses a previously stored enhanced tracking value as a basis for determining the historical tracking value.

119. A processor according to claim 107, further comprising an adaptive illumination control means for controlling the intensity of light emitted by the light source.

120. A processor according to claim 119, wherein the adaptive illumination control means controls the intensity of light in order to optimize the dynamic range of the sensor.

121. A processor according to claim 119, wherein the adaptive illumination control means controls the intensity of light based on a shutter value signal received from the sensor.

122. A processor according to claim 119, wherein the adaptive illumination control means controls the intensity of light based on a contrast signal received from the sensor.

123. A processor according to claim 119, wherein the illumination value is based on the information received from the sensor and an intensity at which the adaptive illumination control means is controlling the light source.

124. A method of processing cursor control data for a cursor control device having a light source and a sensor, the method comprising the steps of:

performing a confidence calculation for determining a tracking confidence value;

performing a projection calculation for determining a projected tracking value, the projection calculation involving a historical tracking value; and

performing an enhancement calculation for determining an enhanced tracking value, the enhancement calculation involving the tracking confidence value, the projected tracking value, and a measured tracking value, the measured tracking value being representative of motion sensed by the sensor.

125. A method according to claim 124, wherein the sensor provides a pair of measured tracking values representative of the sensed motion,

wherein the step of performing a projection calculation is for determining a pair of projected tracking values using respective historical tracking values, and

wherein the step of performing an enhancement calculation is for determining a pair of enhanced tracking values, each of the pair of enhanced tracking values being calculated using the tracking confidence value, a respective one of the pair of historical tracking values, and a respective one of the pair of measured tracking values.

126. A method according to claim 125, wherein each of the pair of measured tracking values, projected tracking values, historical tracking values, and enhanced tracking values is representative of motion in a respective one of a pair of orthogonal directions.

127. A method according to claim 124, wherein the step of performing a confidence calculation for determining a tracking confidence value involves an illumination value representative of an intensity of light sensed by the sensor, wherein the method further comprises the step of performing an illumination calculation for determining said illumination value, the illumination calculation involving a shutter value received from the sensor for a subject sensor scan and a brightness value indicative of an amount of light emitted from the light source during the subject sensor scan.

128. A method according to claim 124, wherein the enhancement calculation is such that if the tracking confidence value is a first value then the enhanced tracking value is equal to the measured tracking value, and if the tracking confidence value is a second value then the enhanced tracking value is equal to the projected tracking value.

129. A method according to claim 128, wherein the enhancement calculation is such that if the tracking confidence value is a third value then the enhanced tracking value equals a weighted combination of each of the measured tracking value and the projected tracking value.

130. A method according to claim 124, wherein the measured tracking value is representative of motion sensed by the sensor during a subject sensor scan, and the historical tracking value is related to at least one sensor scan prior to the subject sensor scan.

131. A method according to claim 130, wherein the historical tracking value is calculated using the enhanced tracking value for said at least one sensor scan prior to the subject sensor scan.

132. A method according to claim 130, wherein the illumination value is representative of an intensity of light sensed by the sensor during the subject sensor scan.

133. A method according to claim 124, further comprising the step of providing the enhanced tracking value to a client device for control of cursor motion.

134. A method according to claim 124, further comprising the step of storing the enhanced tracking value.

135. A method according to claim 134, wherein the steps of performing a confidence calculation, performing a projection calculation, and performing an enhancement calculation are repeated using the stored enhanced tracking value as a basis for determining the historical tracking value.

136. A method according to claim 124, further comprising the step of controlling the intensity of light emitted by the light source.

137. A method according to claim 136, wherein the step of controlling the intensity of light includes controlling the intensity of light in order to optimize the dynamic range of the sensor.

138. A method according to claim 136, wherein the step of controlling the intensity of light includes controlling the intensity of light based on a shutter value signal received from the sensor.

139. A method according to claim 136, wherein the step of controlling the intensity of light includes controlling the intensity of light based on a contrast signal received from the sensor.

140. A method according to claim 136, wherein the illumination value is based on the information received from the sensor and an intensity at which the light source is controlled during the step of controlling the intensity of light.

141. A cursor control device comprising:

a first sensor;

a light source;

a controller that includes:

means for receiving intensity information indicative of an intensity of sensed light; and

an adaptive illumination control means for controlling the intensity of light emitted by the light source based on the intensity information.

142. A cursor control device according to claim 141, wherein the adaptive illumination control means controls the intensity of light in order to optimize the dynamic range of the first sensor.

143. A cursor control device according to claim 141, wherein the adaptive illumination control means controls the intensity of light based on a shutter value signal received from the first sensor.

144. A cursor control device according to claim 141, wherein the adaptive illumination control means controls the intensity of light based on a contrast signal received from the first sensor.

145. A cursor control device according to claim 141, wherein the intensity information is received from a second sensor.

146. A cursor control device according to claim 145, wherein the adaptive illumination control means controls the intensity of light in order to optimize the dynamic range of the first sensor.